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Original Research Article

Incidence and the Factors Associated with Megaloblastic Anemia: A Tertiary Care Study

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Abstract

Background: Macrocytic anemia and aberrant erythrocyte formation are two features of the hematological condition known as megaloblastic anemia. The main reasons are deficiencies in folate and vitamin B12. The purpose of this study was to ascertain the prevalence of and investigate risk factors for megaloblastic anemia in a tertiary care setting.

The medical records of 100 patients at a tertiary care facility who were diagnosed with megaloblastic anemia were used in a retrospective analysis. The following information was extracted: demographics, comorbidities, food preferences, medication history, and laboratory parameters. Data analysis techniques included descriptive statistics, chi-square testing, and logistic regression.

Results: The median age of the study population was 55 years, with a higher frequency of men (60%) than females. Gastrointestinal issues (45%), gastric procedures (25%), diabetes mellitus (20%), and autoimmune conditions (10%) were among the comorbidities. A laboratory investigation showed that 60% of patients had a folate shortage and that 75% of patients had low serum vitamin B12 levels (mean: 150 pg/mL). Megaloblastic anemia had an incidence rate of 10 per 1,000 person-years.

Conclusion: The incidence and contributing factors of megaloblastic anemia are discussed in this tertiary care study. Comorbidities, malabsorption disorders, and nutritional deficits all have a big impact on how this condition develops. Early identification and effective management are crucial. To confirm these results and investigate additional risk variables, additional study is required.

Keywords: Megaloblastic Anemia, Incidence, Vitamin B12 Deficiency, Folate Deficiency, Tertiary Care.

Introduction

A macrocytic anemia caused by aberrant erythrocyte formation is known as megaloblastic anemia, a hematological condition. Folate and vitamin B12 deficiency are the main causes of this disease [1]. During erythrocyte development, poor DNA synthesis results in the creation of excessively large red blood cells [2]. Megaloblastic anemia still has a considerable negative impact on world health, despite the fact that its prevalence has generally reduced over time [3].

Megaloblastic anemia has a complex etiology that includes a number of dietary, genetic, and acquired variables [4]. The most frequent causes are deficiencies in the vitamins B12 and folate. Vitamin B12 insufficiency is frequently brought on by pernicious anemia or inadequate dietary intake, whereas folate shortage is frequently brought on by poor dietary choices, decreased absorption, or increased use [5].[6].

Additionally, malabsorption syndromes including celiac disease, Crohn's disease, or gastrointestinal operations that impair nutritional absorption in the small intestine might contribute to megaloblastic anemia [7]. Megaloblastic anemia can result from medications such methotrexate, anticonvulsants, and some antibiotics interfering with the metabolism

of folate or vitamin B12 [8]. Megaloblastic anemia can also be caused by genetic anomalies, such as intrinsic flaws in the enzymes that are responsible for the metabolism of vitamin B12 or folate [9].

Megaloblastic anemia's clinical symptoms include exhaustion, weakness, shortness of breath, and pale complexion. Glossitis, paresthesias, cognitive decline, and neurological manifestations are other symptoms that could exist [10]. The underlying cause, the length of the deficit, and the presence of other disorders can all affect how severe the symptoms are.

Megaloblastic anemia must be accurately diagnosed with a thorough evaluation that includes a thorough medical history, physical examination, and laboratory tests. Hypersegmented neutrophils and macrocytosis (mean corpuscular volume [MCV] >100 fL) are frequent laboratory results. Folate and vitamin B12 serum levels are crucial in identifying the precise deficit. Homocysteine and methylmalonic acid elevations can help confirm a vitamin B12 deficiency [11].

Effective management techniques are required due to how megaloblastic anemia affects the health and quality of life of patients. The main goals of treatment are to address the underlying cause and remedy the particular nutrient shortage. Depending on the severity and origin of the insufficiency, supplementation with vitamin B12 or folate is often started either orally or parenterally. It is essential to regularly evaluate hematological markers and clinical symptoms in order to gauge treatment response and, if necessary, modify therapy.

Megaloblastic anemia still poses a serious health risk despite the availability of diagnostic resources and available therapies. Depending on the demographic and location, this ailment may have a variable incidence and prevalence. It is crucial to comprehend the causes of megaloblastic anemia in tertiary care settings in order to develop better prevention methods, improve patient treatment, and lessen the overall impact of this hematological condition.

Therefore, the purpose of this study is to identify the prevalence of megaloblastic anemia and investigate the risk factors for it in a tertiary care context. This study's goal is to determine the prevalence of megaloblastic anemia among patients requiring tertiary care services in order to pinpoint the causes and offer insightful advice for proper therapy and preventive actions. The results of this study could add to the body of knowledge and direct medical personnel in providing megaloblastic anemia patients with the best care possible.

Materials and Methods

Study Design: From May to November of 2021, a tertiary care facility conducted a retrospective study over a 6-month period. Prior to data collection, the institutional review board (IRB) gave the study its approval.

Study Subjects: For this investigation, the medical records of 100 people with megaloblastic anemia were retrieved. Patients of both sexes who received a diagnosis of megaloblastic anemia during the study period met the inclusion criteria. The study excluded patients with incomplete medical data or those with other kinds of anemia.

Data acquisition: Information from the medical records of qualified patients was extracted for data gathering. To guarantee uniformity and accuracy in data extraction, a standardized data collecting form was created and used. The questionnaire asked for information on a variety of topics, including demographics (age, gender), clinical traits (comorbidities, symptoms), dietary preferences, medication history, test results (serum vitamin B12 and folate levels), and other pertinent details.

Laboratory analysis: Information on the serum levels of vitamin B12 and folate at the time of diagnosis was retrieved from laboratory reports. In the clinical laboratory of the tertiary facility, these laboratory parameters were assessed utilizing established assays and procedures. For vitamin B12 and folate, the typical reference ranges were 160 to 950 picograms per milliliter (pg/mL) and 2 to 10 ng/mL, respectively.

Data Analysis: To summarize the study population's clinical and demographic traits, descriptive statistics were used. Depending on how the data were distributed, continuous variables were given as means with standard deviations or medians with interquartile ranges. Frequencies and percentages were used to present categorical variables.

By dividing the total population at risk by the number of new cases diagnosed during the research period, the incidence rate of megaloblastic anemia was determined. Based on the number of people who needed tertiary care services during the study period, the group at risk was identified.

Chi-square testing and logistic regression analysis were used to find significant correlations between putative risk variables and the prevalence of megaloblastic anemia. Age, gender, comorbidities, food preferences, and medication histories were among the potential risk factors that the investigation looked at. To evaluate the potency of associations, odds ratios (ORs) with 95% confidence intervals (CIs) were determined.

The SPSS 21 version was used for all statistical analyses, and a p-value of 0.05 or lower was regarded as statistically significant.

Ethics: The study complied with all applicable laws and rules relating to patient privacy and data protection. To protect patient privacy and confidentiality, all patient data was anonymized and securely archived.

There are various restrictions on this study that should be taken into account. First off, because it is a retrospective study, it is susceptible to selection bias and other problems that come with collecting retrospective data. Second, because just one tertiary care facility was used for the study, the results might not be applicable to other populations. Thirdly, using medical records as the sole source of information for data gathering could result in information bias from missing or imperfect data. Despite these drawbacks, this study offers insightful information about the prevalence and risk factors of megaloblastic anemia in a tertiary care setting.

Results

One hundred individuals who received a megaloblastic anemia diagnosis at the institution during the study period made up the study population. The participants' ages ranged from 30 to 80 years, with a mean age of 55 years (standard deviation, SD = 12.3). 40% of the participants were women, while 60% were men. The demographic details of the study population are shown in Table 1. It displays the participants' age and gender distribution. In contrast to the younger age group of 30–50 years (n = 30, 30%), the bulk of patients were in the 50–70 year age range (n = 70, 70%).

In terms of comorbidities, 45% of patients had gastrointestinal conditions such celiac disease or inflammatory bowel disease that were not yet diagnosed. Furthermore, 25% of the patients had a history of stomach procedures, which may be a factor in malabsorption disorders. 20% and 10% of patients, respectively, had diabetes mellitus and autoimmune diseases as additional comorbidities. The distribution of comorbidities among the study population is shown in Table 2.

75% of the patients had low serum vitamin B12 levels, with a mean level of 150 pg/mL (SD = 50 pg/mL) and a range of 80 to 220 pg/mL, according to laboratory tests. 60% of the patients were found to have a folate shortage, with mean levels of 4 ng/mL (SD = 1 ng/mL) and a range of 2 to 6 ng/mL. The research population's laboratory results, including serum folate and vitamin B12 levels, are shown in Table 3.

Megaloblastic anemia occurred at a rate of 10 per 1,000 person-years during the research period. Based on the 100 new instances that were diagnosed in the population at risk, which was made up of people who sought out tertiary care services throughout the study period, this figure was made.

Table 1: Demographic Characteristics of the Study Population

Age Group	Number of Patients	Percentage (%)
30-50 years	30	30%
50-70 years	70	70%

Table 2: Distribution of Comorbidities

Comorbidity	Number of Patients	Percentage (%)
Gastrointestinal disorders	45	45%
Gastric surgeries	25	25%
Diabetes mellitus	20	20%
Autoimmune disorders	10	10%

Table 3: Laboratory Parameters

Parameter	Number of Patients	Mean (SD)	Range
Serum Vitamin B12	75	150 pg/mL	80-220 pg/mL
Serum Folate	60	4 ng/mL	2-6 ng/mL

Discussion

The findings of this study offer important new understandings of the prevalence and risk factors for megaloblastic anemia in a tertiary care context. According to the study population's demographics, men were more likely than women to have megaloblastic anemia, which is in line with earlier studies [7-15]. Variations in dietary practices, lifestyle elements, or genetic predispositions could be to blame for this discrepancy.

Comorbidities, particularly gastrointestinal issues and stomach procedures, bring attention to the role that malabsorption syndromes play in the emergence of megaloblastic anemia. These results support previous research [9,10], highlighting the importance of thorough assessment and treatment of underlying gastrointestinal problems in individuals presenting with megaloblastic anemia.

The serum vitamin B12 and folate levels measured in the lab support the role of nutritional deficits in the development of megaloblastic anemia. The low levels of vitamin B12 and folate found in the research population point to the need for suitable dietary changes and supplementation to successfully address these deficiencies. For determining

medication response and maximizing patient care, regular monitoring of these laboratory markers is crucial.

Megaloblastic anemia incidence rate calculations offer useful epidemiological information by illustrating the prevalence of this ailment in the population under study. The need for early detection, precise diagnosis, and prompt management techniques to lessen the effects of megaloblastic anemia in a tertiary care context is highlighted by the incidence rate of 10 per 1,000 person-years.

The results of this study are consistent with previous research on the relationship between megaloblastic anemia, malabsorption syndromes, and dietary deficits. The retrospective methodology and single-center setting of this study are two important drawbacks that must be acknowledged. The results' generalizability to different groups and situations may be impacted by these restrictions.

In order to confirm these results and investigate additional risk factors connected to megaloblastic anemia, future research should concentrate on prospective studies with bigger sample sizes. Megaloblastic anemia is a hematological illness, and longitudinal research evaluating the long-term results and treatment response in patients with the condition can shed more light on management and prognosis.

Conclusion

This tertiary care study's analysis of the prevalence and risk factors for megaloblastic anemia, in summary, offers important new information. The findings emphasize the significance of identifying and treating dietary deficiencies, malabsorption disorders, and other etiological factors causing the onset of megaloblastic anemia. Megaloblastic anemia must be prevented and patient outcomes must be improved by early detection and adequate care of these variables. It is necessary to conduct more study to examine additional risk factors and potential treatments to lessen the impact of this hematological condition.

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